ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY

Amendment to the Hazardous Waste Handling Facility Safety Analysis Document for the TRU Waste Disposal Project

Environment, Health and Safety Division

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Executive Summary

Background

The purpose of this Amendment is to identify and analyze the radiological hazards associated with the Lawrence Berkeley National Laboratory's (LBNL) Transuranic (TRU) waste disposal project. The Laboratory's TRU waste is currently stored in three facilities: the Hazardous Waste Handling Facility (HWHF), the Pit Room in Building 70, and the Neutron Calibration Facility in Building 75C. Each of these facilities has a current, approved Safety Analysis that regulates the storage and use of its radiological materials. They are all categorized as Radiological Facilities.

The actual process of packaging and disposing of the TRU materials is not specifically covered in these Safety Analyses. This project is organized so that the majority of the work will be performed at the HWHF. No activities for this project will be performed at the B70 and B75C facilities that exceed the bounds of the current Safety Analysis there. Therefore, this analysis is structured as an amendment to the current Final Safety Analysis Document (FSAD) for that facility. It is written as an independent attachment. Ongoing non-TRU waste disposal HWHF operations will continue to be covered by the current FSAD during this project. After project completion, the requirements in this attachment will be obviated.

Though this work is not specifically covered by the current Safety Analyses, it is very similar. The intent was to design the work for this project consistent with the individual current Safety Analyses and in a coordinated fashion between the three. Therefore, much of the hazard analysis from the current Safety Analyses was used as a precedent for this process. A second goal was to achieve a hazard categorization consistent with those of the current facility Safety Analysis.

The TRU waste items in the B75C Neutron Calibration Facility consist of eight alpha-n sealed sources. Seven of these are ^{239}Pu-Be sources ranging from 0.3 Ci to 5 Ci. The eighth item is an ^{241}Am-Be source of 1.4 Ci. These items are currently stored in wells in a secured facility as described in the *B75C Radiation Detection Instrument Calibration Facility Safety Analysis* (Dec. 2001) and that facility is managed as a Radiological Facility.

The TRU waste items in the B70 Pit Room consist of 79 items with activity levels ranging up to 0.98 Ci of ^{241}Am. All items that are greater than 1% of a Nuclear Fraction, as defined in DOE STD1027-92/97, are contained in 2R-compliant containers. The Sum of Nuclear Fractions for the TRU waste materials covered in this project is 5.2. The safety systems for this facility are documented in the *Building 70 Pit Room Safety Analysis* (Nov. 2001) and that facility is managed as a Radiological Facility.

The TRU waste items in the HWHF consist of approximately 400 items with a total Sum of Nuclear Fractions of 0.77. The safety systems for this facility are documented in the *Final Safety Analysis Document for the Hazardous Waste Handling Facility at Lawrence Berkeley National Laboratory* (April 2001). A current restriction in that document does not allow the Sum of Nuclear Fractions to exceed 1.0 under any circumstances; this is why some TRU waste items are currently stored in other facilities. The HWHF is also managed as a Radiological Facility.

The TRU Waste disposal project will package all of the items into WIPP compliant 55-gallon drums. The drums from the B75C and B70 facilities will be transported to the HWHF for storage. At the HWHF, all of these drums will be packaged into the TRUPACT containers. From there, they will be trans-shipped to Lawrence Livermore National Laboratory (LLNL) and then to WIPP for ultimate disposal.

A few of the TRU waste materials are also hazardous and are managed as mixed waste (MW). Currently, LLNL cannot accept mixed TRU waste from an offsite facility. LLNL has agreed to assess the feasibility of requesting a temporary modification to their hazardous waste permit. If this is granted, LBNL will ship its mixed TRU waste in the same shipment. For purposes of hazard categorization, this Amendment assumes that these items will be included in the disposal project. If LLNL ultimately cannot accept these materials, they will remain at the HWHF.

Packaging of the items into 55-gallon drums is an activity that is within the scope of all three of the current facility Safety Analyses. This amendment addresses the internal transport of the packaged TRU materials to the HWHF, interim storage of the TRU materials at the HWHF, and their loading into the TRUPACT containers. Once the TRUPACT containers are sealed, the materials become exempted from DOE STD 1027-92/97 and this amendment is no longer needed.

This amendment follows a graded approach to the Safety Analysis Report format described in DOE STD 3009-94, *Preparation Guide for USDOE Nonreactor Nuclear Facility Safety Reports*. Each of the 17 chapters in the guidance will be addressed, though many of the functions are essentially unchanged from the current FSAD.

Summary and Conclusions

Although the total inventory for the LBNL TRU waste disposal project exceeds the Category 3 Nonreactor Nuclear Facility threshold in DOE STD 1027-92/97, it has been determined that it does not have the potential for significant localized radiological consequences, based on the analysis of radiation doses from potential releases. The Final Hazard Categorization per DOE STD 1027-92/97 is therefore below Hazard Category 3, i.e. Radiological Facility. The HWHF will continue to be managed as a Radiological Facility for this project.

Because the materials and activities in this project are similar to those of the current Safety Analyses at the three facilities, the hazard analyses are similar and the classification is consistent. Transportation accidents, facility accidents, and natural phenomena such as earthquakes and wild land fires were the applicable scenarios both for the current work and for this project. Because the radiological materials are very similar, the doses calculated were consistent.

Of note are the source reduction efforts of the last three years. Inventory at both the B75C and B70 facilities is significantly lower than at the time the current Safety Analyses were performed. As a result, the total amount of TRU waste material to be transported is less than the activity of the single item for which the accident scenarios were constructed in the current Safety Analyses.

The containment systems described in the current facility Safety Analyses remain an important factor in this project. Items from B70 and B75C greater than 1% of a Nuclear Fraction will remain in 2R compliant containers throughout this process.

Release factors associated with accident scenarios were developed using DOE guidance and applied to the radionuclide inventory associated with each scenario. Potential released activity and associated radiation doses of exposed individuals were calculated. This is discussed in detail in Section 3.

The potential dose from catastrophic events during the TRU waste disposal project involving radioactive material is 0.186 rem at 30 meters for fire-caused release (using very conservative assumptions), much less than the guideline dose threshold of 10 rem at that distance applied to Category 3 facilities in DOE STD 1027-92/97.

This potential dose supports a categorization below Category 3. This project, and the facilities involved are classified as Radiological.

1. Site Characteristics

For purposes of the TRU Waste disposal project, the facility described is the HWHF. Though some associated activities in this project will be performed at the B70 and B75C facilities, they are covered in those facilities' current Safety Analyses documents. Transport on-site from those facilities to the HWHF, as well as all storage and packaging operations there, is covered by this amendment. Therefore the appropriate facility described in this section is the HWHF.

This section is not modified for this project.

2. Facility Description

2.1 Facility Description

This project will be performed at the HWHF. This facility is as described in the current FSAD with no significant modifications.

2.2 Process Description

The TRU Waste Disposal project consists of very simple operations, consisting only of transportation, storage, and loading. All materials will already have been solidified, if necessary, and packaged into compliant 55-gallon drums. The materials already at the HWHF will be moved to the appropriate storage area and placed on pallets. Most items are normal TRU waste and will be stored in RW1; a few of the items are mixed TRU waste and will be stored in MW6, in accordance with the Part B permit. These are the only two rooms that will be used for the TRU Waste project.

The materials from the B70 Pit Room and B75C Neutron Calibration Facility will be separately transported from those facilities to the RW1 storage area in the HWHF. The TRU waste in RW1 will make up the bulk of waste in that room, but a small amount of other waste may be co-located. This amount will be limited to less than one 55-gallon drum with no more than 10 mCi of alpha activity and total activity of 100 mCi. The TRU Waste materials in MW6 will be stored with a significant amount of other materials. By the conditions of the permit and the current FSAD, up to 1100 gallons and 440 mCi of other alpha-emitting radioactive , mixed waste may be stored in that room in addition to this project.

The materials will be stored in these two areas until the WIPP containers arrive. At this point, the TRUPACT containers will be transported to the B85 lower yard. The 55-gallon drums will be loaded into the TRUPACT containers in predetermined configurations. As each TRUPACT is completed, it will be closed and sealed. Only one TRUPACT container at a time will be loaded.

If LBNL is able to include the mixed TRU waste, these materials will also be loaded into the TRUPACT container. After all 55-gallon drums have been loaded

and the TRUPACT containers certified, they will be transported to LLNL. Though not planned, it may be necessary to open some of the drums, for either safety or quality assurance reasons. In this event, the items will be transported back to their original facilities and this work will be conducted under the provisions of the current Safety Analysis for that facility. After the work is completed, the materials will be repackaged back into the 55-gallon transport drums and brought back into the TRU Waste disposal project, and returned to the HWHF. The Berkeley Site Office will receive prior notification in these instances.

Operational details of this project will be closely overseen by the Radiation Protection Group with formal authorizations guiding this work.

3. Hazard and Accident Analysis

3.1 Hazard Identification

The only major hazard associated with this project is the potential release of radioisotopes (due to fire or other initiating event), and associated personnel exposure to airborne contaminants.

3.2 Hazard and Accident Evaluation

3.2.1 General

Risks associated with the planned activities of the TRU waste disposal project are minimal. This is a short-term project with minimal handling and complexity. There is no handling of unsealed materials; all materials are stored in 55-gallon drums throughout the process. No contamination is expected, and the dose to workers is expected to be minimal.

Because the TRU materials will be stored at the HWHF and packaging into the TRUPACT containers will be done there, each of the accident scenarios associated with the routine facility operations in the current FSAD was evaluated for this project. These included: on-site transportation accidents, facility accidents such as fires and spills, and the natural phenomena of earthquakes and wild land fires.

A significant release due to a wild land fire was determined to be extremely unlikely. The design of the facility, the aggressive vegetation management adjacent to the site, and the robust containment of the TRU waste materials provide effective controls in the event of a wild land fire. Nevertheless, a scenario comparable to the 1991 Oakland Hills fire was modeled and a dose was calculated.

The other natural phenomenon considered was an earthquake. The current HWHF FSAD examined this and found the risks to be identical with that of a facility spill accident. An independent dose calculation was not performed. This hazard analysis follows that precedent.

The current HWHF FSAD evaluated a number of spill scenarios. It found that materials in 55-gallon drums were extremely unlikely to ever be released due to a spill. This project enhances that containment by using 2R containers for all B70 and B75C materials greater than 1% of a Nuclear Fraction. For this project, no credible scenarios were developed for spills of the B70 and B75C materials that are within 2R containers. It may be possible for the other TRU waste materials to be spilled. However, these scenarios would be identical to those in the current HWHF FSAD since the sum of Nuclear Fraction of these TRU waste materials is less than those in the bounding accidents in that document. Therefore, these scenarios were not developed further.

The facility-based fire was determined to be the only credible accident that carried over from the hazards analysis of the routine operation of the HWHF. This was due to the potential for a fire within rooms RW1 or MW6 while the TRU Waste materials were in interim storage there.

Two other accident scenarios were developed that arose directly out of this project's operations. The first involved a vehicle accident and subsequent fire while transporting materials from B75C or B70 to the HWHF. The second involved a fire in the TRUPACT transport vehicle while loading the TRU Waste materials into the TRUPACT containers.

These particular scenarios were examined in detail and the maximum Committed Effective Dose Equivalent (CEDE) from each scenario was calculated for onsite and offsite receptors.

3.2.2 Release Factors

This hazard analysis used the same release factors for these materials as was used in the current Safety Analyses for each of the facilities. These were:

Facility Safety Analysis	Release Factor
B75C	5 E-05
B70	1 E-03
HWHF	1 E-03

Table 3-1. Release Factors

Following is a summary of the logic for these values. For a more complete discussion, see the original Safety Analysis documents.

B75C TRU materials. These materials are sealed sources used for neutron calibrations and are contained within 2R compliant vessels, which are themselves contained within WIPP compliant 55-gallon drums. The neutron sources are a metallic matrix with volume less than 1% of the volume of the containers. The containers would shield the material inside from the violent convection currents that occur during a major fire or earthquake. While small leaks between the cap and pipe threads could develop at fire temperatures or during earthquakes, the aerial size of any leaks is estimated to be much less than 1% of the surface area inside the container. The release will be further mitigated by the gasket that has been added to the container (optional under the DOT specifications). Additional containment is achieved by the source encapsulation itself (at least double steel capsules for the neutron sources).

Given that these items are sealed sources, are contained in 2R containers that are further contained within sealed 55-gallon drums, a release factor 5E-5 was applied

to these materials. This is 20 times lower than the suggested general release factor for solid/liquid/powder in DOE STD 1027-92/97.

B70 TRU materials. These materials are miscellaneous solids or powders. Higher-level radioactive materials are also contained inside 2R vessels. All are stored within sealed 55-gallon drums. As with the B75C materials, the 2R containers are postulated to mitigate releases to a lower release fraction than the general release fractions suggested in DOE STD 1027-92/97 for solid/powder/liquid (E-3). To be conservative and to maintain consistency with the current B70 Safety Analysis, the release fraction in the standard was used in the accident analysis.

HWHF TRU materials. The release fraction used in the current HWHF FSAD for materials in 55-gallon drums is 1 E-03 which is consistent with the value suggested in DOE STD 1027-92/97. Since all TRU materials will be in 55-gallon drums, this value is also used in this analysis.

3.2.3 Receptor Distances and Heights

Conservative assumptions were made for the receptor height and distance. For each of the scenarios, the possible range of receptor heights and distances was determined. From these ranges, the values that resulted in the maximum dose to the receptor were chosen. In all cases, this resulted in the receptor height being equal to the fire plume's effective height. The distances from the release point to receptors were determined to be as follows:

Scenario	On-Site Receptor (1)	Off-Site Receptor (fence line)	Receptor Height
On-site Vehicle Fire (2)	30 meters	30 meters	20 meters
HWHF Facility Fire (3)	30 meters	120 meters	13 meters
HWHF Vehicle Fire (3)	30 meters	120 meters	13 meters
Wild Land Fire (4)	n/a	500 meters	150 meters

Table 3-2. Distances and Heights

1. The on-site receptor distance was chosen to coincide with the distance used in the EPA model to calculate Category 3 thresholds in DOE STD 1027-92/97. The dose calculated at that distance can then be compared to the 10-rem threshold value for categorization purposes. It is a reasonable distance for an onsite receptor in the release plume during a major initiating event.

2. The accident location is on Lawrence Road approximately 100 meters before the underpass with Centennial Road. The receptor location is 30

meters due north on Centennial Road. This location is the optimization of receptor height and receptor distance that results in the maximum intake for this scenario.

3. The location is 120 meters in the WSW direction (255 degrees) from the HWHF. This is on Centennial Road approximately 100 meters uphill from the underpass. This also is the optimization of receptor height and receptor distance that results in the maximum intake for this scenario.

4. The location is on Grizzly Peak Road 500 meters from the HWHF in the NNE direction. This is the optimization of receptor height and distance.

3.2.4 Dose Modeling

The maximum personnel dose (CEDE) was calculated using version 98 of "HOTSPOT," a computer code designed for this purpose by S. Homann of Lawrence Livermore National Laboratory's Hazards Control Department.

This version allows for the input of the actual mix of isotopes and activities for the activity source term of each scenario. Some parameters were assumed to be standard for all accident scenarios. These are listed below:

- All material released was assumed to be particles of respirable size.
- Average measured LBNL meteorological parameters were applied (moderately stable conditions and wind velocity of two meters per second).
- No credit for mitigation of release is given to active systems such as sprinklers
- Short-term releases (< 24 hours)
- Dispersion of releases follows the gaussian-plume model
- Wind speed during release is 2 m/s
- Winds are moderately stable (Pasquill category "F")

In addition, there are scenario-specific parameters. Some, such as release fractions and receptor height are discussed above. Others, such as fuel and fire release radius, are listed in each scenario section.

3.2.5 Accident Scenarios

A. Vehicle-caused fire during transport of the TRU waste material from B75C Neutron Calibration Facility.

Assumptions:

A vehicle transporting the TRU waste material from B75C to the HWHF is involved in an accident that results in a fire. All eight items are stored in their 2R containers within one or two 55-gallon drums. The worst case location for this fire is near the underpass of Centennial Road leading to the HWHF.

- Source term: ~20 Ci of various TRU. See attachment B for precise inventory used in the calculation
- Model: general fire
- Fuel: 20 gallons gasoline
- Effective release radius: 3 meters
- Release fraction: 5 E–5
- Receptor height (set): 20 meters (receptor on overpass above release, in center of fire plume)
- Receptor distances: 30 meters for on-site and off-site receptor

Results:

Maximum On-Site Receptor CEDE: 0.020 rem
Maximum Off-site Receptor CEDE: 0.020 rem

B. Vehicle-caused fire during transport of the TRU waste material from B70 Pit Room Facility.

Assumptions:

The above scenario was repeated for the material being transported from the B70 Pit Room to the HWHF.

- Source term: ~3 Ci of various TRU. See attachment B for precise inventory used in the calculation.
- Model: general fire
- Fuel: 20 gallons gasoline
- Effective release radius: 3 meters
- Release fraction: 1 E–3
- Release height (calculated): 20 meters

- Receptor height (set): 20 meters (receptor on hill above release, in center of fire plume)
- Receptor distances: 30 meters (on site); 30 meters (offsite fence line)

Results:

Maximum On-Site Receptor CEDE: 0.077 rem
Maximum Off-site Receptor CEDE: 0.077 rem

C. Vehicle fire during loading of B70 and B75C materials.

Assumptions:

This scenario assumes that the vehicle carrying the TRUPACT containers somehow is involved in an accident while both sets of TRU waste from B70 and B75C are being loaded into the TRUPACT containers. The analogous scenario of a similar accident occurring during loading of the HWHF materials was not modeled due to the very much lower activities involved.

- Source term: Sum of inventories from both B70 and B75C. See attachment B for precise inventories used in the calculations.
- Model: general fire
- Fuel: 50 gallons gasoline
- Effective release radius: 10 meters
- Release fraction: 5 E–5 for the B75C materials and 1 E-03 for the B70 materials
- Release height (calculated): 13 meters
- Receptor heights (set): 13 meters
- Receptor distances: 30 meters (on site); 120 meters (offsite fence line)

Results:

Maximum On-Site Receptor CEDE: 0.164 rem
Maximum Off-site Receptor CEDE: 0.086 rem

D. Facility fire during storage of the TRU waste materials.

Assumptions:

All TRU waste materials are stored in RW1. (This is conservative; a small amount will be stored in MW6.) During this timeframe a fire occurs in this room. The fire involves both the TRU waste and the other rad waste co-located there (less than 100 mCi total activity and 10 mCi of alpha activity). Very little

material is available as fuel (four pallets and a small amount of paper material inside the drums). Nevertheless a fire of similar characteristics to Scenario C is assumed. As with the current HWHF FSAD, it is assumed that a fire is restricted to a single room (due to the construction of the facility).

- Source term: entire TRU waste inventory at LBNL plus 0.1 Ci of alpha activity co-located in RW1. See attachment B for precise inventories used in the calculations.
- Model: general fire
- Fuel: 50 gallons gasoline
- Effective release radius: 10 meters
- Release fraction: 1 E-03 for HWHF, HERL, Pit Room materials. 5 E-05 for B75C sealed sources.
- Release height (calculated): 13 meters
- Receptor height (set): 13 meters (receptor on hill above release, in center of fire plume)
- Receptor distances: 30 meters (on site); 120 meters (offsite fence line)

Results:

Maximum On-Site Receptor CEDE: 0.186 rem
Maximum Off-site Receptor CEDE: 0.097 rem

E. Wild land fire while materials are stored at the HWHF.

Assumptions:

A wild land fire occurs during the period that the TRU waste materials are stored in RW1/MW6. The scenario is based on measurements from the 1991 Oakland Hills fire, and is consistent with a similar scenario used in the B75C Safety Analysis.

- Source term: entire TRU inventory at LBNL. See attachment B for precise inventories used in the calculations.
- Model: general fire
- Plume Height: 300 meters
- Effective release radius: 10 meters
- Release fraction: 1 E-03 for HWHF, HERL, Pit Room materials. 5 E-05 for B75C sealed sources.
- Release height (calculated): 150 meters
- Receptor height (set): 150 meters

- Receptor distances: 500 meters

Results:

Maximum On-Site Receptor CEDE: n/a
Maximum Off-site Receptor CEDE: 0.0006 rem

3.2.6 Dose Consequences

The maximum radiation exposures from accident-initiated releases of radiological materials from the TRU waste project are summarized in Table 3-3. Appendix B has the HOTSPOT code output reports.

Scenario	Modeled On-site maximum CEDE (rem)	Modeled Off-site maximum CEDE (rem)
Vehicle fire B75C materials	0.020	0.020
Vehicle fire B70 materials	0.077	0.077
Vehicle fire during loading	0.164	0.086
Facility fire during storage	0.186	0.097
Wild land fire during storage	n/a	0.0006

Table 3-3. Radiation Dose Consequences

3.3 Defense in Depth

This project involves very simple operations of sealed radiological materials in a very robust facility. No direct handling of these materials is anticipated. If required, limited handling of materials may be done within the facility and no opening of materials within 2R containers will be allowed. While in storage, items with significant activity levels are stored within 2R-compliant vessels. All materials are further contained within 55-gallon drums. The operations are limited to on-site transportation of some of the materials to the HWHF, interim storage there, and loading into the TRUPACT containers. This limits the number of scenarios that could result in release of material and/or personnel radiation exposure.

Safety systems include the containment, ventilation and fire-suppression systems at the HWHF. The facility itself provides robust containment, which is further augmented by: encapsulation for the sealed sources, 2R vessels for items from

B75C and B70 that have activity greater than 1% of the DOE STD 1027-92/97 category 3 limits, and further containment in the 55-gallon drums.

Additional engineering controls that provide defense in depth in the case of an accident are the facilities' ventilation and fire suppression systems.

Additional controls that reduce the likelihood of consequences include the security system with very limited access, and administrative controls such as inventory control, and authorization-based safety requirements.

3.4 Facility Categorization

Inventory alone results in a preliminary categorization as a Hazard Category 3 Facility per DOE STD 1027-92/97. The radiological hazard analysis, however, shows that there is no potential for significant localized consequences. The final categorization is therefore below Category 3, i.e. Radiological Facility.

Consequences of potential accidents resulting from radionuclides in the HWHF for the TRU waste disposal project are far below thresholds for categorization as a Category 3 Non-Reactor Nuclear Facility per DOE STD 1027-92/97. The guidance in the standard indicates that Category 3 Facilities pose "significant localized consequences." The Category 3 radionuclide thresholds are based on a potential dose of 10 rem at 30 meters. The calculated maximum potential dose from release of TRU Waste disposal project radionuclides is 0.186 rem at 30 meters. These doses are much lower than 10 rem at 30 meters, which justifies a categorization below Category 3.

4. Safety Systems

4.1 Safety Class Systems

There are no safety class systems.

4.2 Safety-Significant Systems

Failure of a safety system in the HWHF would not result in a life-threatening or disabling injury to a worker. The systems described here have features that contribute to mitigating an uncontrolled release of radioactive material in the event of an accident and thus support the low consequences determined in the Hazard Analysis.

4.2.1 Storage Containment System

The primary container for storage of radioisotopes >1% of a nuclear fraction for items from B70 and B75C is a DOT-specification 2R

container. These containers are built on site according to specifications in 49 CFR 178.360. A typical 2R container is a 2- to 4-inch diameter schedule-40 stainless steel pipe 8 inches long with welded cap on one end and threaded cap the other end. Typically the threaded cap end is gasketed with a copper ring gasket, optional under the specifications.

Further containment of all materials is provided by WIPP compliant 55-gallon drums.

Containment is provided by the HWHF facility itself. While in interim storage, all materials will be located in RW1 or MW6, H7-occupancy zone with concrete curbs and a trench/sump system to contain any spills.

Final containment will be provided by the TRUPACT containers.

4.2.2 Fire Protection System

The building is protected from fire by the construction of fire barriers and engineered fire suppression and alarm systems. These systems are supplemented with the Alameda County Fire Department response and administrative controls.

This system is as described in the current FSAD with no significant modifications.

5. Technical Safety Requirements

The Operational Safety Requirements (OSRs) from the current FSAD will remain in effect, excepting those restricting the facility and drum limits for alpha activity, which are replaced by the project-specific limits below. The current facility and drum limits for alpha activity will remain in force for the non-TRU Waste project materials.

Notable among these current OSRs are the fire suppression and emergency power systems.

5.1 Inventory

The radionuclide inventory is limited for this process. The list of items from each of the three facilities is listed in Attachment A. No other items are authorized for inclusion in this TRU waste disposal project. A Radiation Work Permit (RWP) will be issued to regulate these activities and will include only these items on the attached TRU waste materials project list.

No more than 10 mCi of alpha activity and 100 mCi total activity in a volume not to exceed 55 gallons will be stored in RW1 while the TRU waste materials are in storage.

5.2 Containment

All sources from B70 and B75C exceeding 1% of the Category 3 thresholds are stored in 2R-compliant vessels.

2R containers are constructed in accordance with specifications in 49 CFR 178.360.

Only WIPP compliant 55-gallon drums will be used.

5.3 Transport

The materials from B70 will be transported separately from the materials from B75C.

5.4 Storage

The only storage areas that will be used for this project are RW1 and MW6 at the HWHF.

While the TRU waste materials are in storage in RW1 at the HWHF, no more than 55 gallons of other rad waste totaling 100 mCi of total activity and 10 mCi of alpha activity may be co-located.

5.5 Activities

The only activities allowed under this amendment are transport of the materials to the HWHF, storage there, and loading onto the TRUPACT containers. While in storage, no 55-gallon drums of TRU waste will be opened. Should this be required, the materials will be transported back to their original facility and any manipulations of this material will be done under the provisions of that facility's current Safety Analysis. BSO will be notified should this be required.

5.6 Loading

Only one TRUPACT container will be loaded at a time.

6. Prevention of Criticality

Not applicable. A critical mass cannot occur in the Calibration Facility or in total on site.

7. Radiation Protection

Radiation protection practices are described in detail in the LBNL Radiation Protection Program (RPP), rev. 6, May 2002, approved by DOE. The TRU Waste disposal project activities will be covered by a Radiation Work Permit (RWP). The authorization process is described in the RPP. The authorizations limit inventory, specify authorized workers and training requirements, dosimetry, and general precautions and requirements. The TRU Waste disposal project RWP will require compliance with the technical safety requirements listed in Section 5.

Survey requirements: Documented radiation surveys, inventory, and RWP compliance assessments will be performed during and at completion of the project by Radiation Protection Group personnel.

Radiological conditions: The storage facility, rooms RW1 and MW6, will be posted appropriately while materials are in storage. The entire lower level of the HWHF is a Controlled Area. Further posting as a Radiation Area will be done as appropriate, when materials are being loaded into the TRUPACT containers. HWHF workers have received minimal radiation exposures, less than 100 millirem per year.

In the event of a spill or other contamination incident, the HWHF support systems (ventilation, gloveboxes, containment, etc.) will be used to manage the incident. This may include isolation, containment, identification, and repackaging of materials.

8. Hazardous Material Protection

A few of the items are managed as mixed wastes. The hazardous constituents in these wastes do not present any additional hazards. The control systems are as described in the current FSAD with no significant modifications.

9. Radioactive and Hazardous Waste Management

This project is a waste disposal project. No ancillary wastes are expected to be generated as a result of these activities.

10. Initial Testing, Surveillance, and Maintenance

10.1 Containment

The 2R containers are certified in-house to have been constructed according to DOT specifications.

The 55-gallon drums are WIPP compliant and evaluated both by LLNL and LBNL waste management staff.

The TRUPACT containers are individually certified by WIPP.

10.2 Fire Protection System

The fire protection system is maintained to have the functions described in detail in the current FSAD. There are no significant modifications to this system for this project.

10.3 Vegetation Management

LBNL is currently actively managing the growth and reducing the potential fire hazards from this urban-wildland interface through the Vegetation Management Program. Tree groves have been thinned recently, and growth is monitored in order to prevent wildland fires from affecting the facility.

11. Occupational Safety

The general aspects of occupational safety are covered elsewhere in this amendment and in the current FSAD.

The major radiation safety requirements are specified in the Radiological Work Permit discussed in Section 7.

The facility-specific fire protection system at the HWHF is as described in the current FSAD with no significant modifications.

12. Procedures and Training

12.1 Procedures

The tasks involved with the TRU Waste disposal project are specifically controlled by the Radiological Work Permits discussed in Section 7. Other procedures that apply to the facility are:

- The HWHF Radiological Work Authorizations

- The HWHF Part B Permit
- HWHF Standard Operational Procedures
- LBNL PUB 3000, Health and Safety Manual

12.2 Training

General radiation worker training and on-the job training (OJT) is required for authorized workers. OJT includes the RWP and specific EH&S procedures. Radiation Worker training must be renewed every 24 months.

13. Human Factors

In general, the operations associated with this project are very simple, consisting mainly of transport, storage and loading tasks. Also, most of the safety significant systems consist of engineering controls (fire suppression systems, ventilation controls, facility containment). Therefore, the human factor issues are minimal.

The main issues are to ensure that the radioisotopes are in the proper storage containment systems, as described in Section 4.2.1, that the materials in the B70 and B75C facilities are transported safely when transferred to the HWHF, that radiation safety surveys are carried out to reduce exposure and contamination, and that the proper safety precautions are taken when the materials are loaded into the TRUPACT containers.

This is assured by training, administrative controls, and surveillance.

14. Quality Assurance

Overall LBNL quality assurance is in accordance with the DOE-approved LBNL Operating and Assurance Plan (OAP). Requirements of 10 CFR 830 Subpart A are implemented through the OAP and its tiered programs. For the HWHF operations, these consist of the RPP, its own management Quality Assurance Plan, and its RWAs and RWPs. All Quality Assurance requirements are met through these activities.

For the TRU Waste disposal project, the main QA issues are assuring the specifications of the containers; the 2R vessels and the 55-gallon drums. The 2R primary containment vessels are designed and manufactured on site according to specifications in 49 CFR 178.360. Specification materials are procured via Facilities Department purchase procedures. Containers are independently inspected and verified after manufacture by the staff hazardous material transportation expert. All 55-gallon drums are procured by LLNL via a WIPP certified program. These drums are inspected prior to use according to LLNL TRU waste management procedures and are also independently inspected by HWHF and LLNL personnel.

15. Emergency Preparedness

The building has a building emergency plan that includes the implementation of required emergency response training. This system is as described in the current FSAD with no significant modifications.

16. Decontamination and Decommissioning

Not applicable. This is a short-term project that uses pre-existing facilities that will remain in operation following completion of this project.

17. Management, Organization, and Institutional Safety Provisions

17.1 General

Safety responsibility and management is outlined in LBNL/PUB-3000 and in the LBNL Radiation Protection Program (RPP). LBNL commits itself to perform radiation work safely, in a manner that strives for the highest degree of protection for employees, participating guests, visitors, the public, and the environment, commensurate with the nature and scale of the work. To achieve this goal, Berkeley Lab has formed an Integrated Safety Management (ISM) Plan. This plan is based on ISM principles, which are reflected in the detailed policies and procedures of the Laboratory. Principal investigators, managers, and supervisors are expected to incorporate these principles into the management of their work activities. While these principles apply to all work, the exact implementation of these principles is flexible and can be tailored to the complexity of the work and the severity of the hazards and environmental risks. LBNL division directors are responsible for the safety of activities in their division with the assistance of division safety committees.

17.2 Radiation Protection Organization

The major institutional committee overseeing the RPP is the Radiation Safety Committee (RSC), which reports directly to the Laboratory Director. The RSC advises LBNL Management on all matters related to occupational and environmental radiation safety. The RSC reviews and recommends approval of radiation safety policies, reviews radioactive waste issues, and provides oversight of the Radiation Protection Program. The Radiological Control Manager (RCM) is responsible for development, implementation, and management of the LBNL Radiation Protection Program. The RCM reviews and approves all authorizations to use radiation in conjunction with the RSC. Functions and resources of the Radiation Protection Program, including operation of the Radiation Protection organization, and the support functions, such as dosimetry and calibration, are described in the RPP.

17.3 Authorization Process

The system of controlling radiation work is based on the issuance of written authorizations. This program is designed to keep personnel radiation exposures as low as reasonably achievable (ALARA) by providing administrative control of work activities involving radiation and by ensuring that adequate safety precautions are taken in areas with radiological hazards. Based on an analysis of the project's hazards, requirements such as dosimetry, bioassay, engineering controls, user and EH&S surveys, instrumentation, ALARA work procedures, and protective equipment must be specified. The authorization limits work in the following ways: authorized personnel, authorized radioisotopes, inventory limits, authorized areas, and scope of work. Routine assessments must be made by the radiation protection organization to determine compliance with the requirements and to assess radiological conditions. An authorization can be terminated by division management, the RCM, or the RSC in response to repeated or serious violations of the requirements, or unsafe conditions.

The HWHF is covered by a Radiological Work Authorization and Radiological Work Permits, and the TRU Waste Disposal project will be covered by a Radiological Work Permit. Specific requirements are discussed Section 7.

18. References

18.1 DOE Orders, Standards, etc.

- DOE Order 5480.1B, Safety Analysis and Review System
- DOE Order 6430.1A, General Design Criteria
- DOE STD 1027-92/97, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports, Change Notice 1,1997
- DOE STD 3009-94, Preparation Guide for USDOE Nonreactor Facility Safety Reports
- DOE HDBK-3101-94, Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities

18.2 Other Regulations

- Uniform Building Code, latest revision
- NFPA Standards 13, 24, 25, 110, latest revisions
- 10 CFR 830, DOE Nuclear Safety Management
- 10 CFR 835, DOE Occupational Radiation Protection

- 29 CFR 1910, Occupational Safety and Health Standards
- 49 CFR 173, 178.360, U.S. Transportation and packaging regulations

18.3 Berkeley Lab Documents

- LBNL/PUB-3000, the LBNL Health and Safety Manual
- LBNL Operating and Assurance Plan
- LBNL Master Emergency Plan
- LBNL/PUB-3140, the LBNL Integrated Environment, Health, and Safety Management Plan
- LBNL Radiation Protection Program, rev. 6
- B75C Neutron Detection Instrument Calibration Facility Safety Analysis
- B70 Pit Room Facility Safety Analysis
- Final Safety Analysis Document for the Hazardous Waste Handling Facility at LBNL.

List of Appendices

Appendix A

Source inventories listed for HWHF, B70 and B75C

Appendix B

Accident Radiation Dose Model Output

Appendix B1 – Scenario A. Vehicle-caused fire during transport of the TRU waste material from B75C Neutron Calibration Facility.

Appendix B2 – Scenario B. Vehicle-caused fire during transport of the TRU waste material from B70 Pit Room Facility.

Appendix B3 – Scenario C. Vehicle fire during loading of B70 and B75C materials.

Appendix B4 – Scenario D. Facility fire during storage of the TRU waster materials.

Appendix B5 – Scenario E. Wild land fire while materials are stored at the HWHF.

Appendix A

Source inventories listed for HWHF, B70 and B75C

Appendix B

Accident Radiation Dose Model Output

Appendix B1

Scenario A. Vehicle-caused fire during transport of the TRU waste material from B75C Neutron Calibration Facility

Appendix B2

Scenario B. Vehicle-caused fire during transport of the TRU waste material from B70 Pit Room Facility.

Appendix B3

Scenario C. Vehicle fire during loading of B70 and B75C materials.

Appendix B4

Scenario D. Facility fire during storage of the TRU waste materials.

Appendix B5

Scenario E. Wild land fire while materials are stored at the HWHF.